GROUP 11A

ENGINE MECHANICAL <134>

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GENERAL INFORMATION

M2112000100404

The newly developed 1.1L 134910 engine features 3-cylinder, 12-valve, and double overhead camshafts (DOHC).
The engine family has the following features.

- Aluminum cylinder block
- A counter balance shaft
- MIVEC (Mitsubishi Innovative Valve timing Electronic Control system)
- Selective valve tappet of direct acting valve system for valve clearance adjustment
- Timing chain

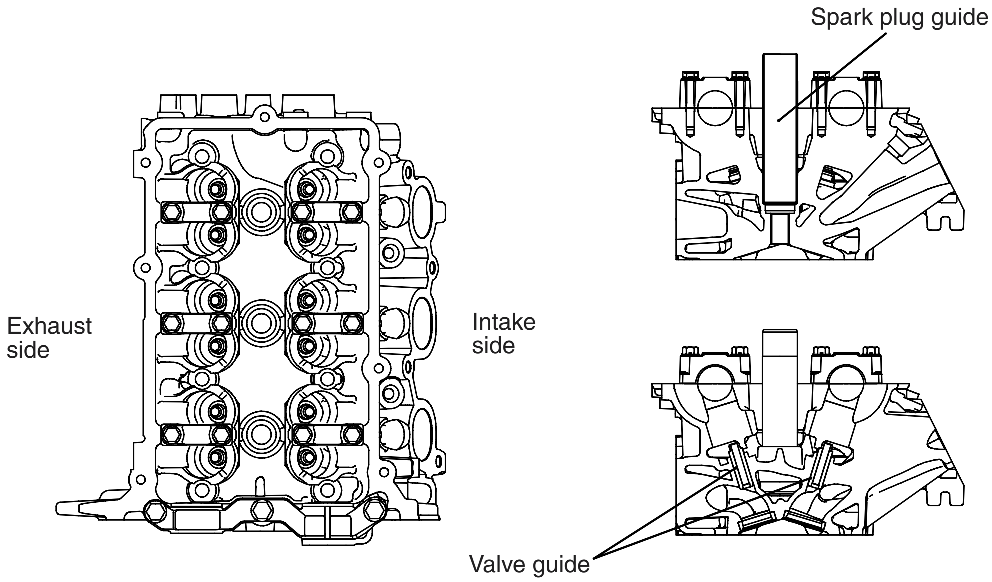
MAJOR SPECIFICATIONS

Item		Specification
Total displacement mL		1,124
Bore × Stroke mm		75 × 84.8
Compression ratio		10.5
Compression chamber		Pentroof-type
Valve timing	Intake opening	BTDC 41° – ATDC 9°
	Intake closing	ABDC 19° – ABDC 69°
	Exhaust opening	BBDC 35°
	Exhaust closing	ATDC 5°
Maximum output kW (PS)/rpm		55 (75)/6,000
Maximum torque Nm (kgm)rpm		100 (10.2)/3,500
Fuel system		Electronically controlled multipoint fuel injection
Ignition system		Electronic-controlled 3-coil

BASE ENGINE

M2112001000325

CYLINDER HEAD

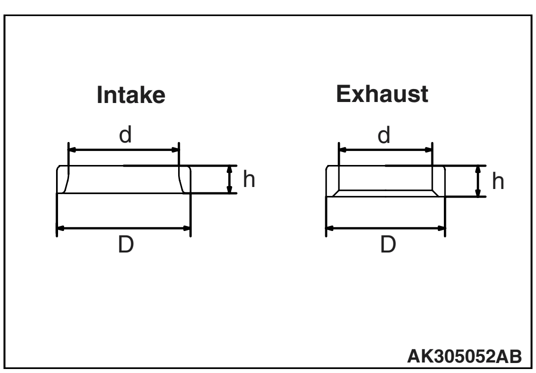


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The cylinder head is made of aluminum alloy, which is lightweight and has an excellent cooling efficiency. The pentroof type combustion chamber has a spark plug in the center. The valve angle is relatively small, contributing to size reduction.
The intake and exhaust ports are arranged in a cross-flow construction. Each cylinder has a pair of intake ports on one side and a pair of exhaust ports on the other side.

Each of the intake and exhaust camshafts is supported by 4 bearings. On each camshaft, the thrust load is supported by No. 1 bearing. The No. 1 bearings for the intake and exhaust camshafts have a common bearing cap.

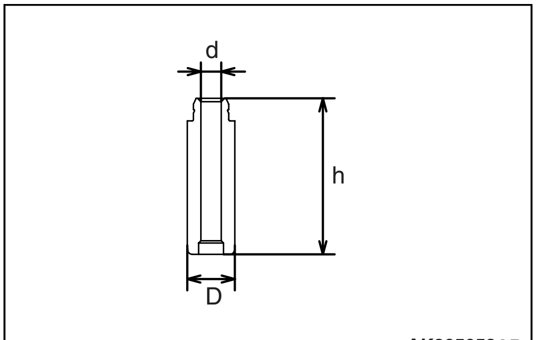
VALVE SEAT



Sintered alloy valve seat

Item	Intake	Exhaust
D (Outer diameter) mm	31.5	28
d (Inner diameter) mm	26	22
h (height) mm	6.6	7.3

VALVE GUIDE

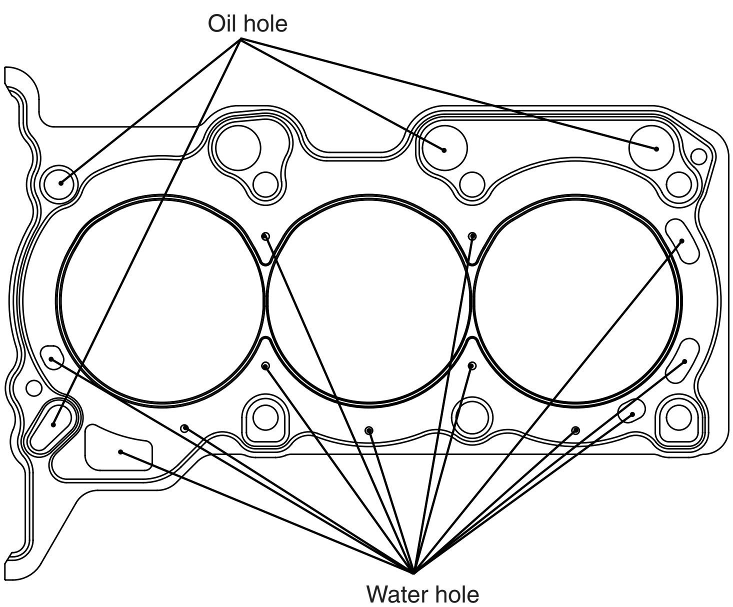


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The intake and exhaust valves use the same-design valve guide.

Item	Specification
D (Outer diameter) mm	10.5
d (Inner diameter) mm	4.5
h (height) mm	34.5

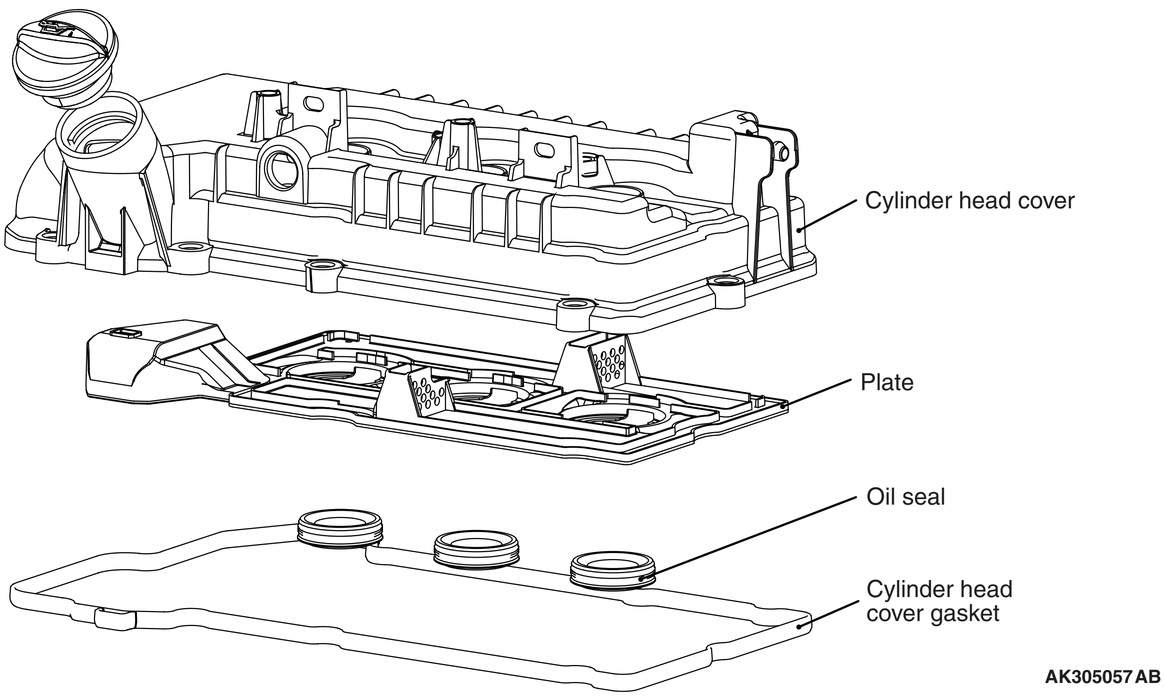
CYLINDER HEAD GASKET



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The metal gasket having the one layer of wave stopper is used for the cylinder head gasket.

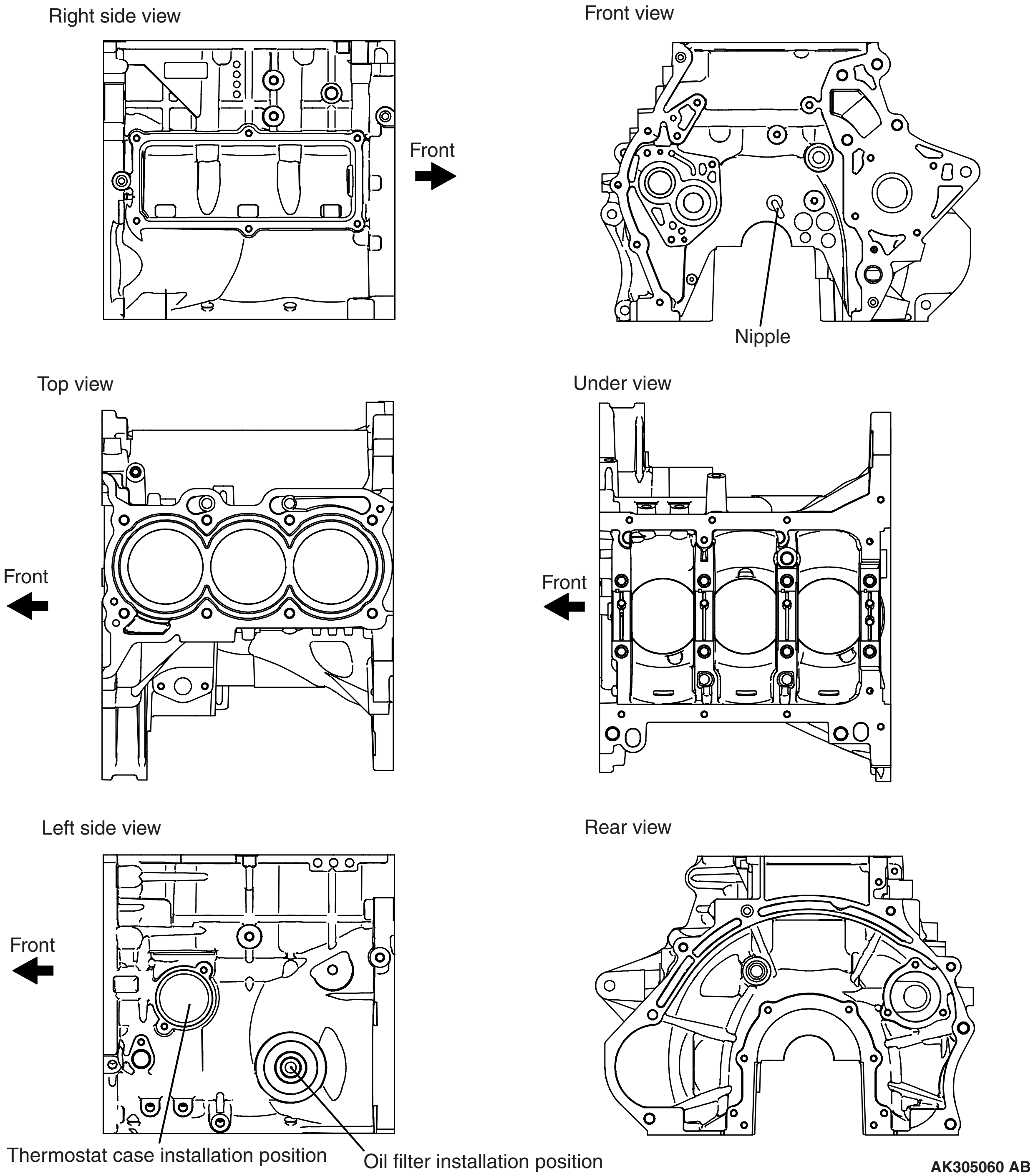
CYLINDER HEAD COVER



A resin cylinder head cover is used for the cylinder head.

The oil plate and the oil seal are integrated with the cylinder head cover assembly.

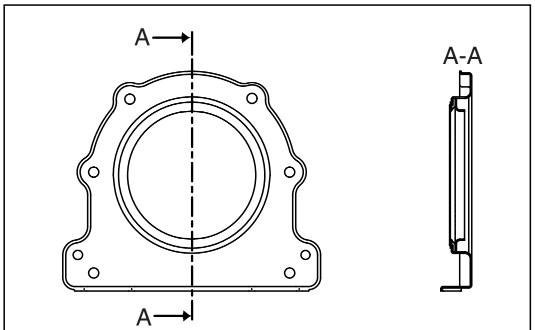
CYLINDER BLOCK



The cylinder block is made of lightweight aluminum alloy.
The crankshaft journal is supported by 4 bearings.
The crankshaft thrust load is supported by No. 3 bearing.
The water jacket is of a full-siamese design.
A nipple is provided at the front of the block to supply engine oil onto the timing chain.

Item	Dimension
Overall height mm	280
Overall length mm	292.1
Top face to crankshaft center mm	205
Crankshaft center to bottom face mm	75
Bore mm	75
Bore pitch mm	83
Stroke mm	84.8

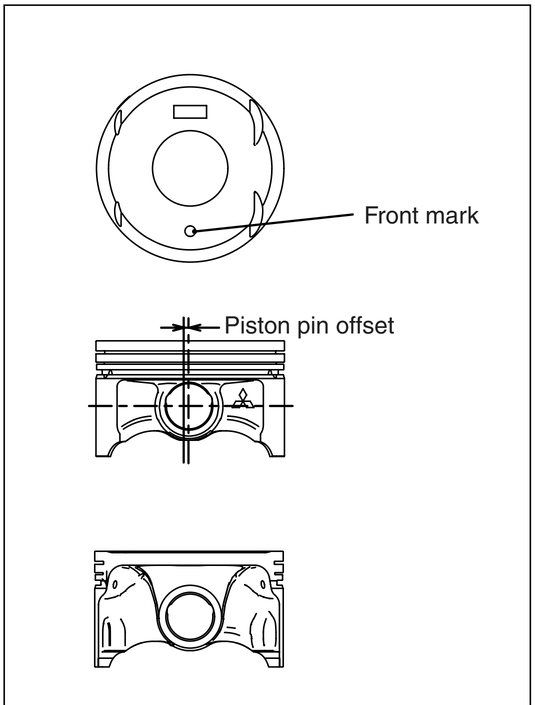
REAR OIL SEAL CASE



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The rear oil seal case is a sheet-metal work. The case is installed with sealant applied onto the mounting face to prevent oil leakage.

PISTON



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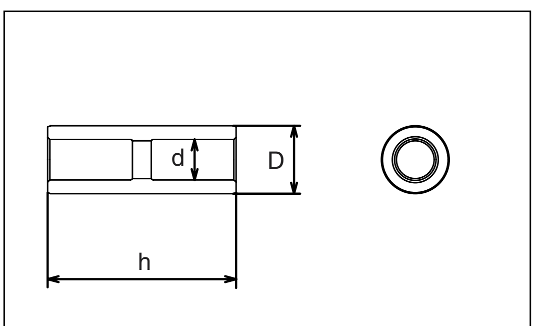
The piston is made of special aluminum alloy. Weight reduction is achieved by minimizing the overall height while maximizing the recess on both ends of the piston pin.

The center of the piston pin hole is offset by 0.5 mm from the center of the piston towards the thrust side.

The piston skirt has a streak finish to enhance oil retention and anti-seizing property.

Item	Dimension
Base diameter mm	75
Pin diameter mm	18
Overall height mm	46.04

PISTON PIN

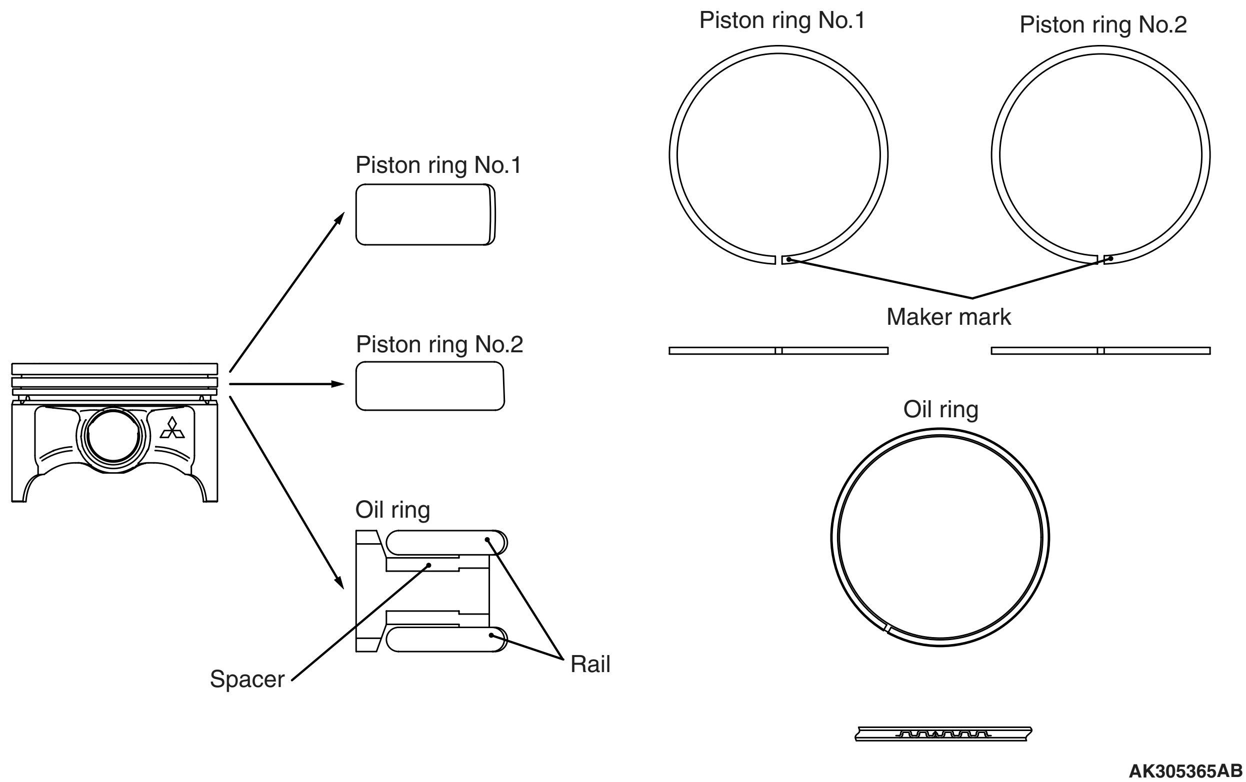


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The piston pin is of a semi-floating type, press-fitted into the connecting rod small end while capable of floating relative to the piston.

Item	Dimension
Outer diameter mm	18
Inner diameter mm	11
Overall length mm	50

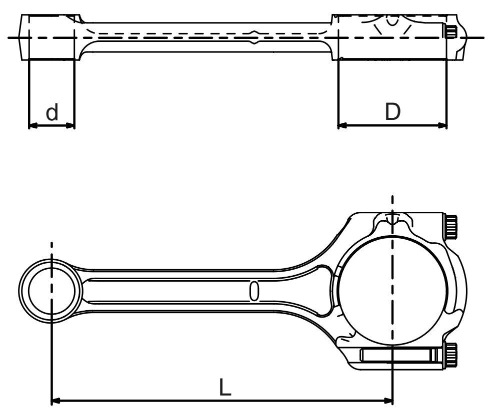
PISTON RING



Each piston is provided with No. 1 and No. 2 compression rings and an oil ring.

Item	No. 1 piston ring	No. 2 piston ring	Oil ring
Shape	Barrel	Tapered	3-piece
Surface treatment (Contact face with cylinder)	Nitride coated	Parkerized	Hard chrome plated
Maker mark	R	2R	No marking

CONNECTING ROD

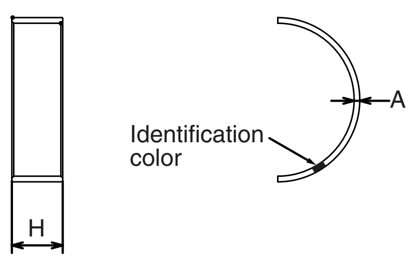


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The connecting rod is made of highly rigid, forged carbon steel. The rod portion has an H-shaped cross section.
The connecting rod big end bearing is lubricated through an oil passage running from the main journal to the crankshaft pin.

Item	Dimension
d (Small end inner diameter) mm	18
D (Large end inner diameter) mm	43
L (Center distance) mm	135.6

CONNECTING ROD BEARING

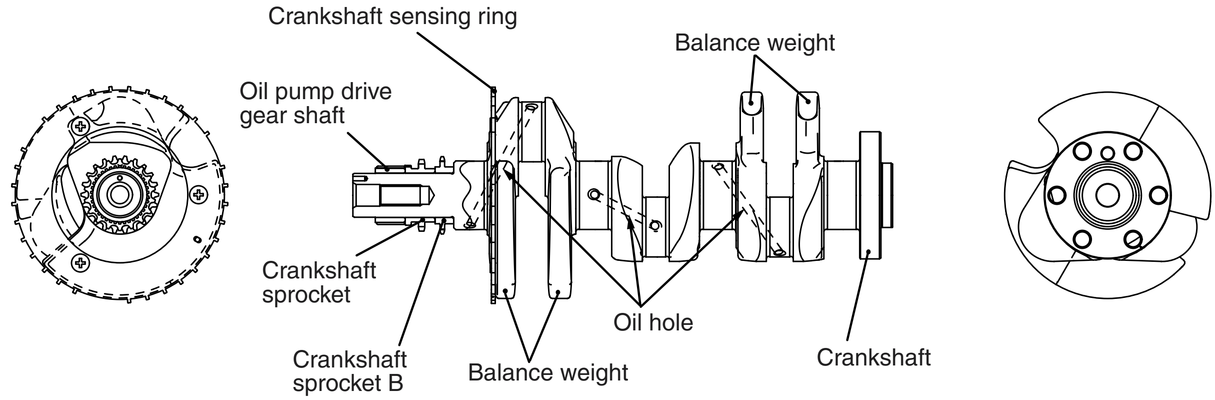


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The upper and lower connecting rod bearing halves are identical.
The connecting rod bearing is equipped with back metal. While the bearing itself is made of aluminum alloy, the back metal is normally made of steel sheet.
The connecting rod bearing is narrower than the bearing cap, this is to minimize wear.

Item	Dimension
H (Width) mm	13.5
A (Thickness) mm	1.5

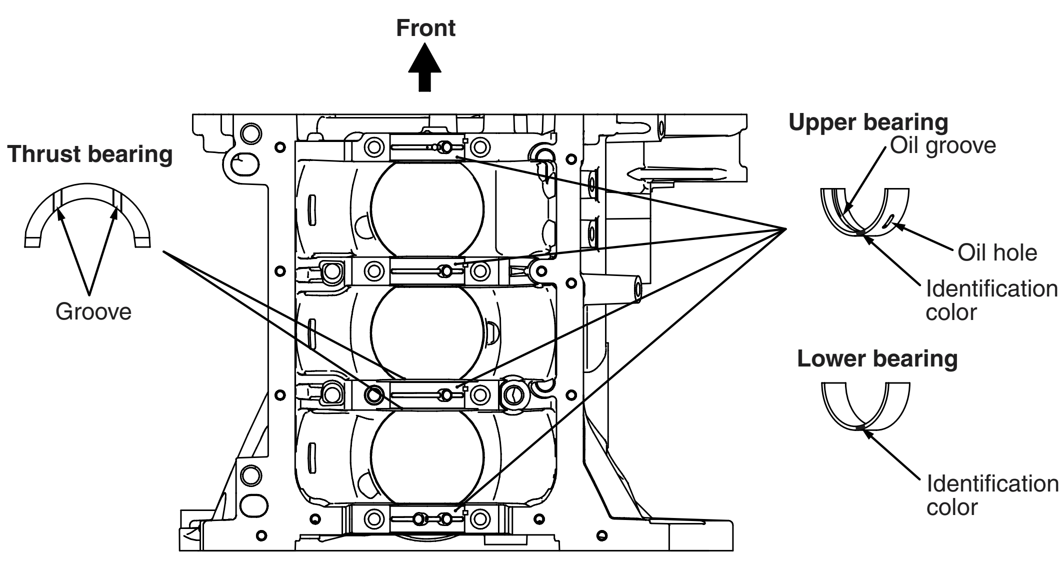
CRANKSHAFT



A casted crankshaft is used for the crankshaft.
The crankshaft consists of 4 main bearings and 4 balance weights.
The crankshaft pins are arranged at 120° intervals.
The oil hole supplies lubrication oil from the journal to the crank pin.

A crankshaft sprocket, an oil pump drive gear shaft, and crankshaft sprocket B are press-fitted onto the front of the crankshaft.
The crankshaft is also fitted with a crankshaft sensing ring.

CRANKSHAFT BEARING, THRUST BEARING

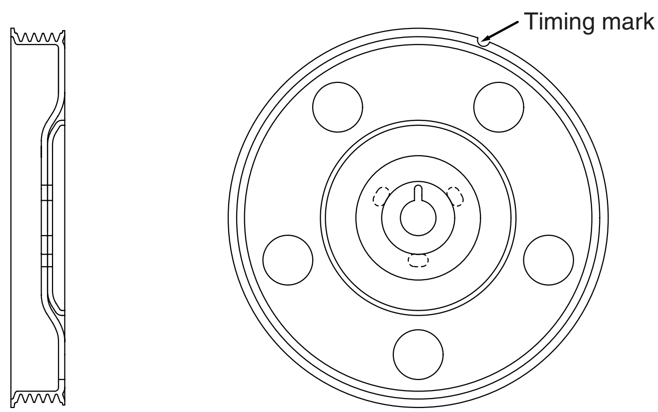


The upper crankshaft bearing (with oil groove) is located on the cylinder block side while the lower bearing (without oil groove) is held by the bearing cap.

The crankshaft bearing is equipped with back metal. While the bearing itself is made of aluminum alloy, the back metal is made of steel sheet.
A thrust bearing is installed on both sides of the No. 3 crankshaft bearing.

Item		Dimension
Crankshaft bearing	Width mm	16
	Thickness mm	20
Crankshaft thrust bearing	Thickness mm	3.275

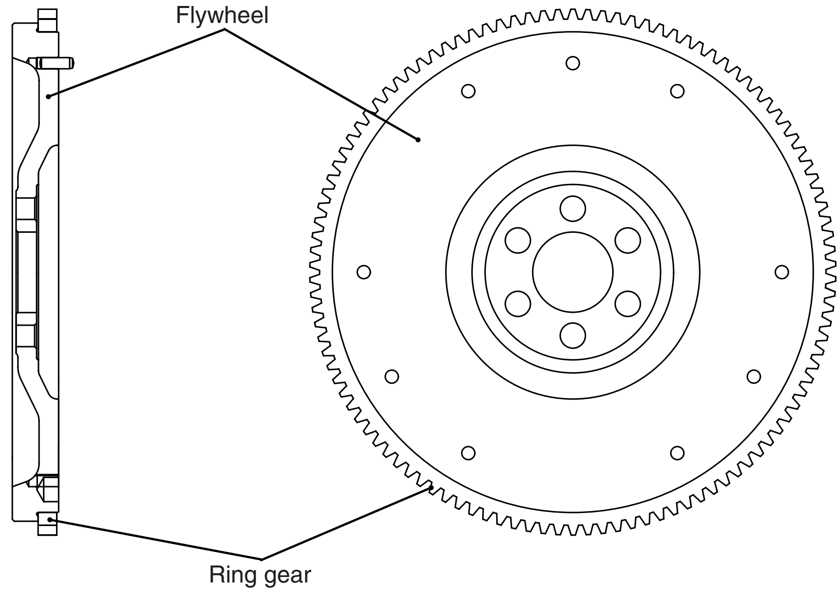
CRANKSHAFT PULLEY



The crankshaft pulley is made of steel plate. The pulley has grooves to engage with a V-ribbed belt (5 ribs), which drives an alternator and a water pump.

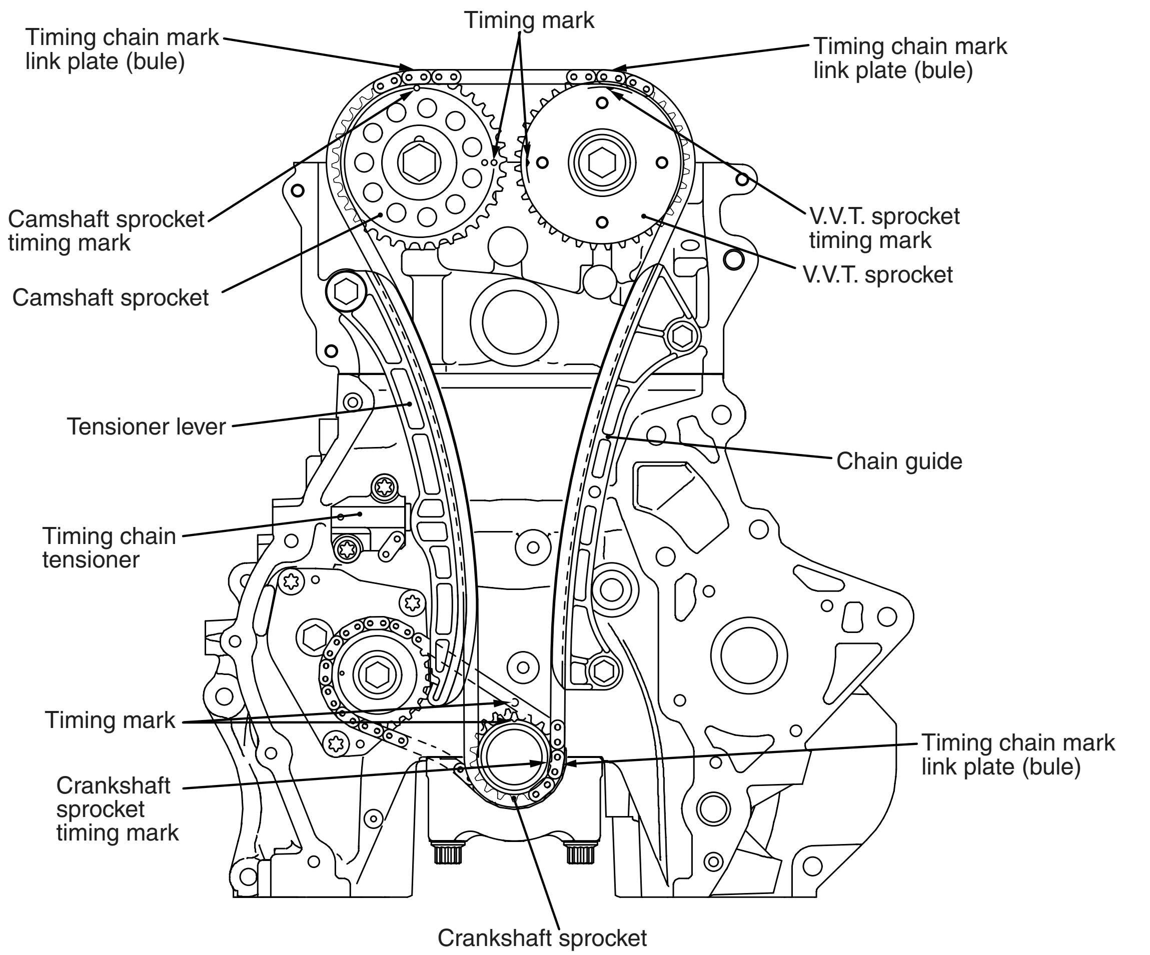
An ignition timing mark (notch) is stamped on the flange of the pulley.

FLYWHEEL



The flywheel is made of cast-iron. A separate ring gear is mounted on it.

TIMING CHAIN TRAIN



The 2 camshafts are driven by the timing chain via the respective sprockets.

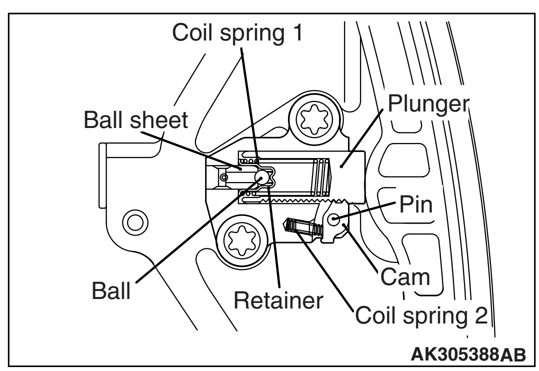
The timing chain, consisting of 122 links, is an endless chain, connecting the crankshaft sprocket with the camshaft and V.V.T. sprockets.

The timing chain is equipped with 3 mark link plates (blue) to correctly time the 3 sprockets with each other.

The timing chain is tensioned by the timing chain tensioner, which has a built-in plunger with plunger springs.

Item	No. of teeth
Camshaft sprocket	36
V.V.T. sprocket	36
Crankshaft sprocket	18

TIMING CHAIN TENSIONER

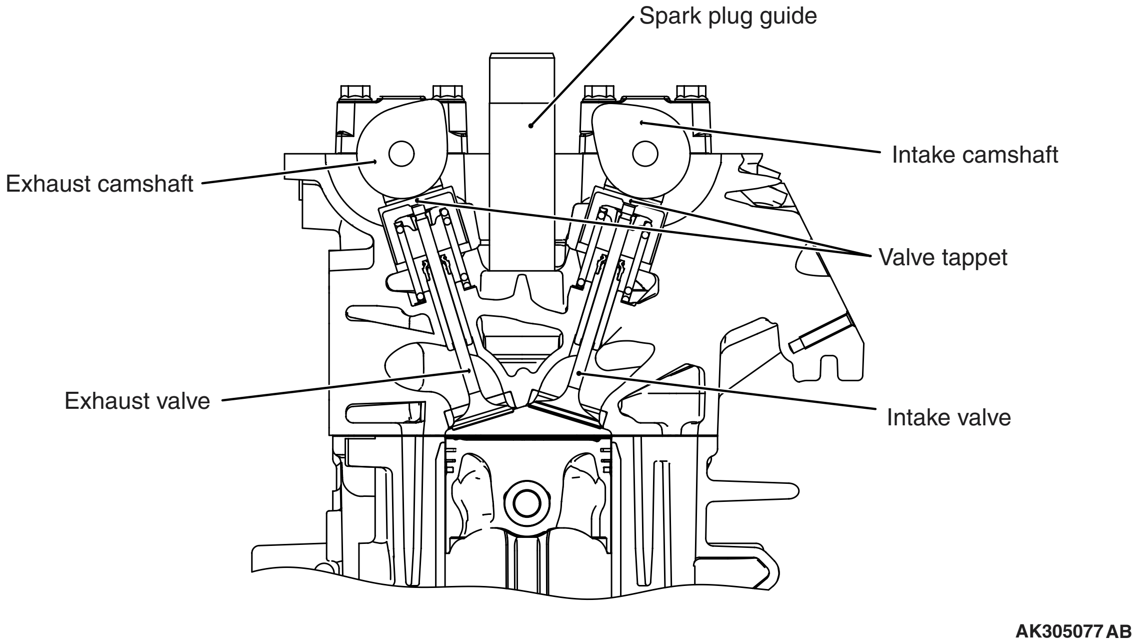


The plunger in the timing chain tensioner directly pushes the tension lever, and the pressure automatically adjusts the timing chain tension.

A cam is provided to lock the plunger in place after the engine stops. This helps prevent the timing chain from wobbling just after the engine starts.

With the timing chain tensioner installed, do not crank the engine in the reverse direction. This will force the plunger to overcome the cam, or even cause other problems.

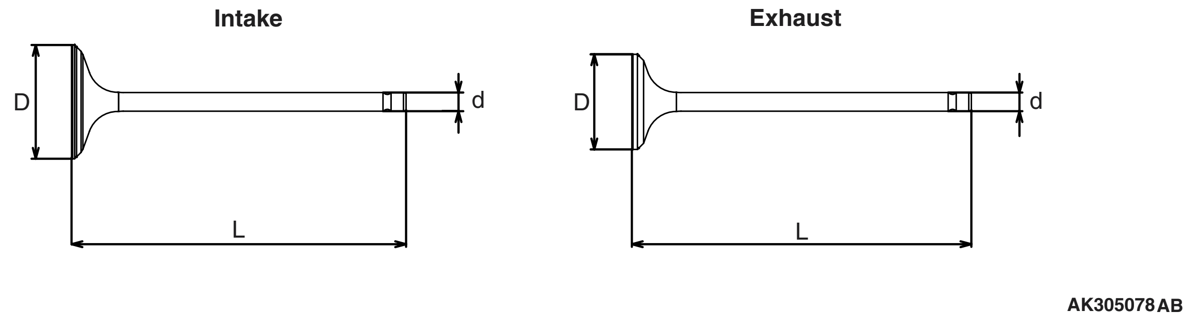
VALVE MECHANISM



The valve mechanism is based on a 4-valve DOHC (Double Over Head Camshaft) design having the camshaft on the upper valve. Each cylinder has 2 intake valves and 2 exhaust valves, arranged in a V-shape pattern.

Camshaft rotation is transmitted via valve tappets to the respective valves which open and close accordingly.

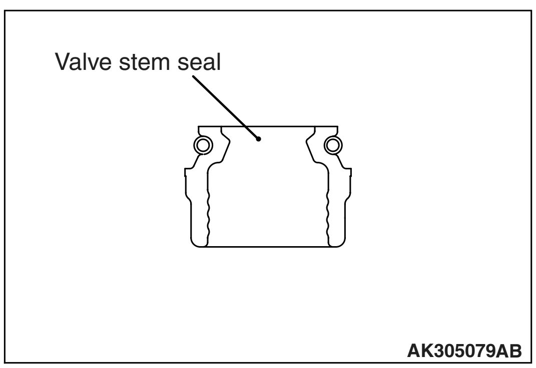
VALVE



The valves have heat-resistance. The entire valve surface is treated with gas nitriding.

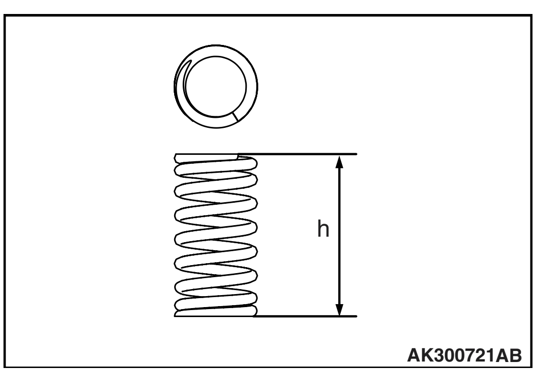
Item	Intake valve	Exhaust valve
Head diameter mm	30.5	25.5
Stem diameter mm	5.0	5.0
Overall length mm	89.61	90.94

VALVE STEM SEAL



The valve stem seal employs springs to enhance sealing performance, minimizing oil passing down to the port.

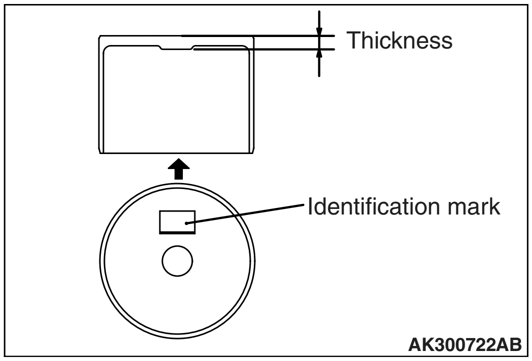
VALVE SPRING



The valve spring has a dual pitch spring to prevent surging in the high speed range.

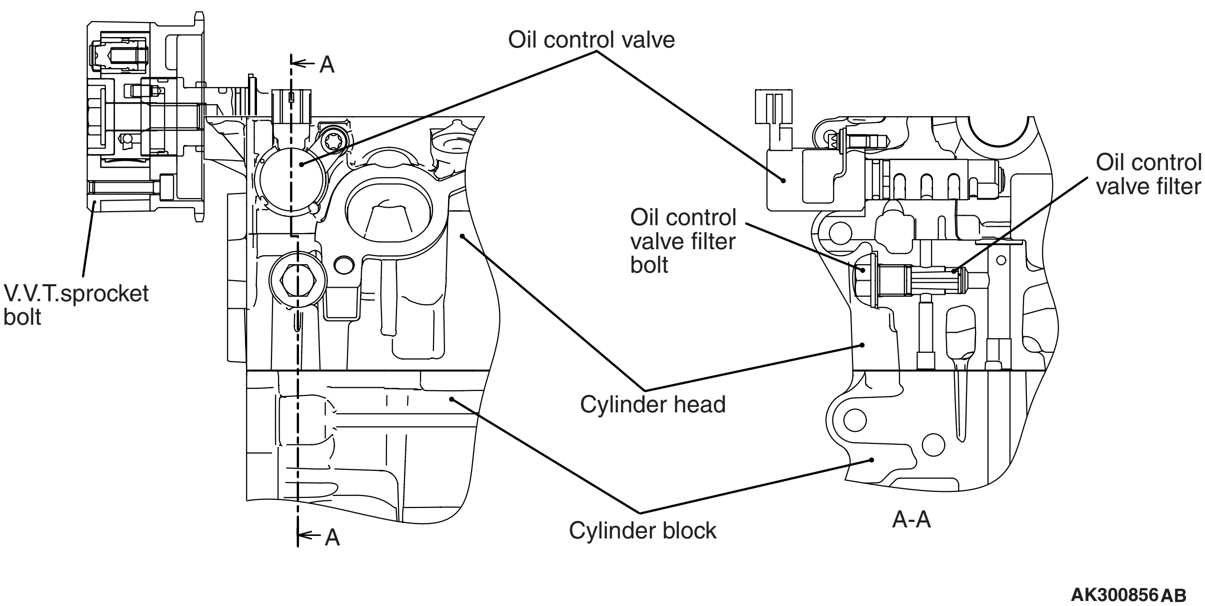
Item	Specification
Free length mm	43.1
No. of spring turns	8.49

VALVE TAPPET



Valve tappets are available in 31 thicknesses, at 0.02 mm intervals between 2.70 mm and 3.30 mm, to ensure correct valve clearance.

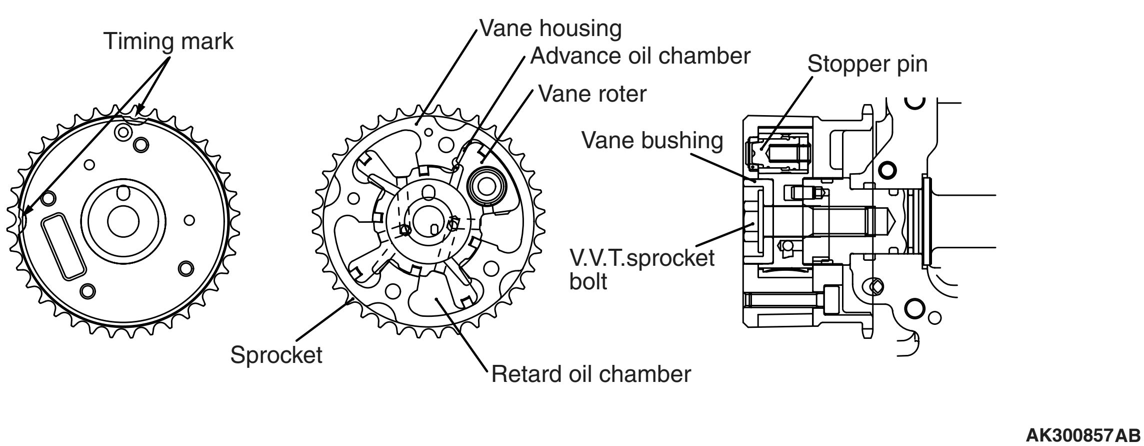
MIVEC (MITSUBISHI INNOVATIVE VALVE TIMING ELECTRONIC CONTROL SYSTEM)



MIVEC (Mitsubishi Innovative Valve timing Electronic Control system) consists of the components illustrated above.

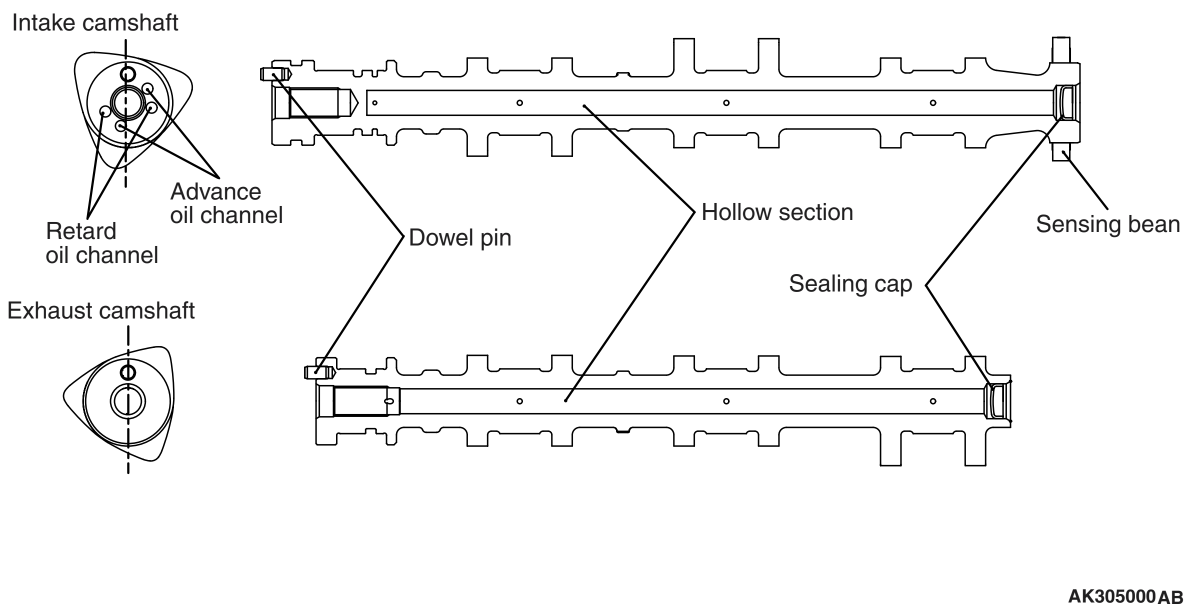
The intake valve timing is optimally controlled (continuously variable) under the changing driving conditions to improve power in the entire speed range.

V.V.T. SPROCKET (VARIABLE VALVE TIMING SPROCKET)



Oil from the oil control valve is sent to the V.V.T. sprocket, moving the vane rotor and thus regulating the valve timing.

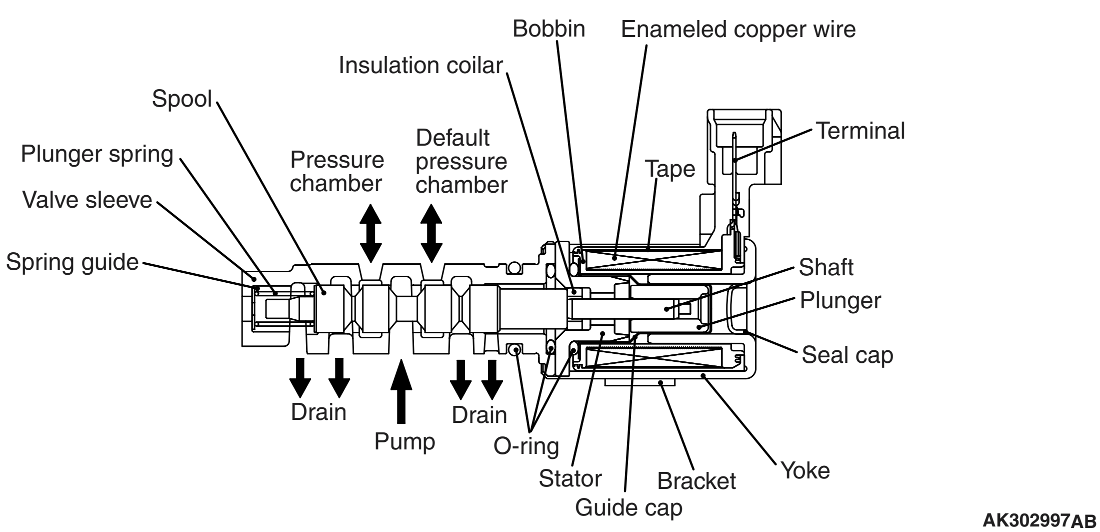
CAMSHAFT



The lightweight camshaft is achieved by the hollow design.
Oil channels run through the intake camshaft, through which oil is sent from the oil control valve to the V.V.T. sprocket.
A cam position sensing ring is press-fitted onto the rear portion of the intake camshaft.

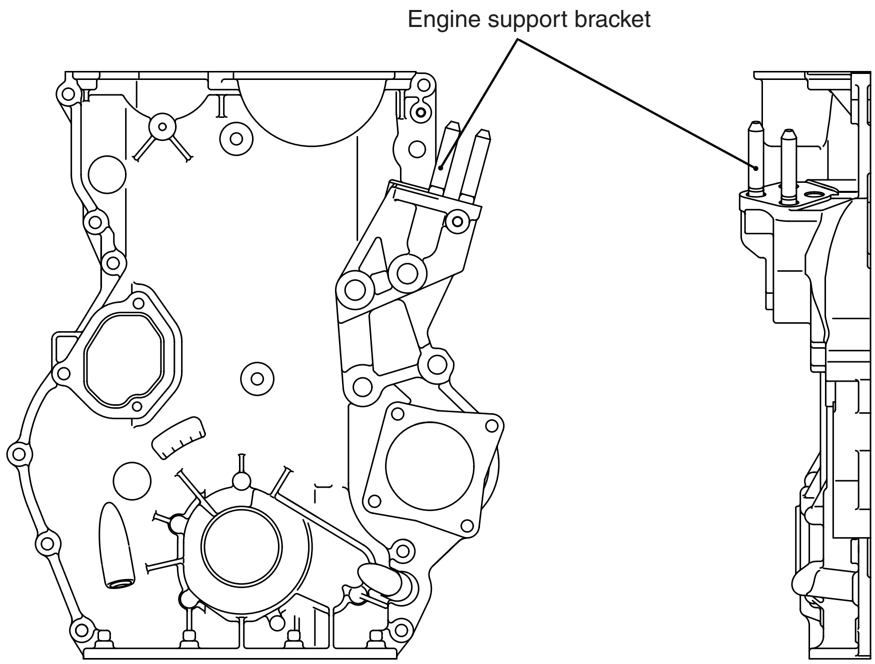
Item		Dimension
Overall length mm	Intake	324.5
	Exhaust	278.9
Journal mm		26
Valve lift mm	Intake	8.5
	Exhaust	7.6

OIL CONTROL VALVE (OCV)



The oil control valve is essentially a solenoid valve, regulated by the engine-ECU or engine-A-M/T-ECU signals to feed oil to the V.V.T. sprocket assembly to move the vane rotor.

TIMING CHAIN CASE



AK305244AB

The engine support bracket, the oil pump and the relief valve are integrated as well as water chamber of the water pump.

BALANCER

The 3-cylinder engine has three throws distributed at equal intervals. The motion of No. 1 and No. 3 pistons generates pitching moment around the No. 2 cylinder. This unbalancing moment is canceled out by the following system.

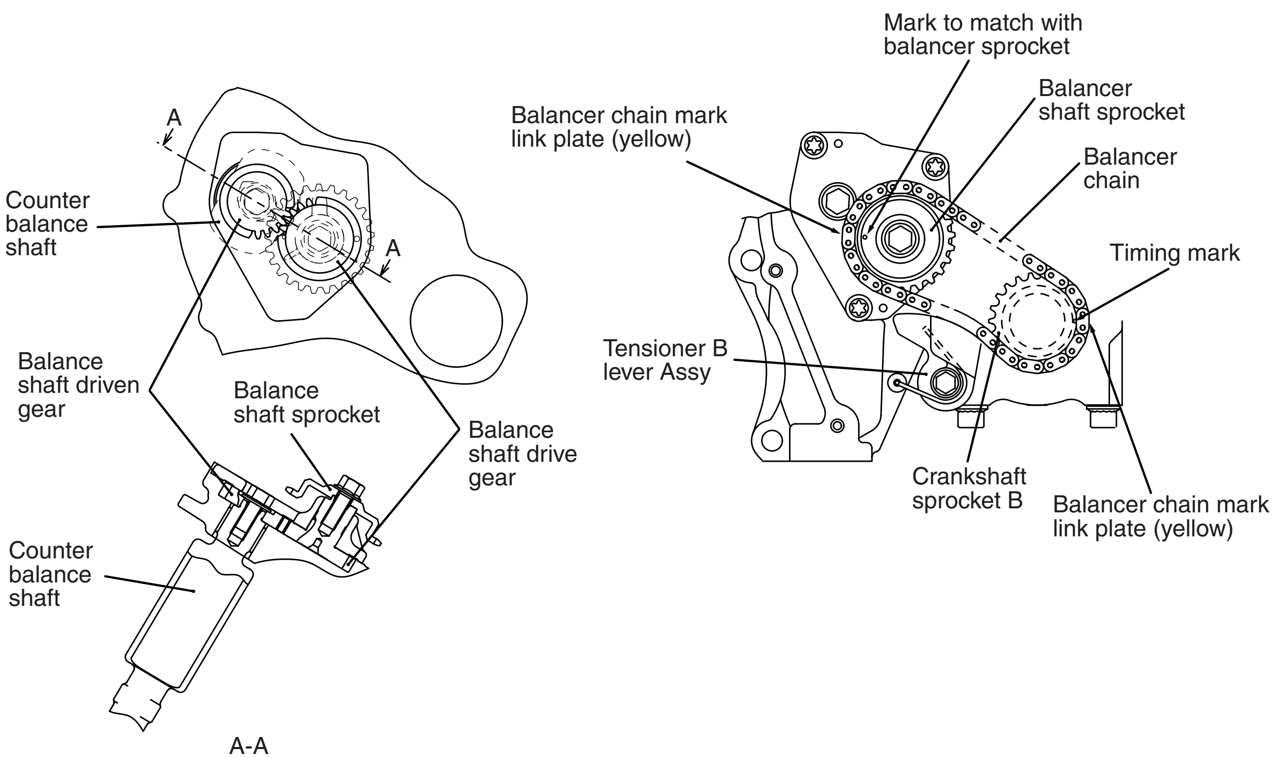
The crank webs for No. 1 and No. 3 cylinders are fitted with overbalance weights.

A counterbalance shaft is provided in parallel with the crankshaft that rotates at the same speed but in the opposite direction from the crankshaft.

The counterbalance shaft is fitted with weights that are balanced in mass with the overbalance weights fitted on the No. 1 and No. 3 cylinder crank webs.

The inertia force generated by the pistons and overbalance weights are cancelled out by the counterbalance weights, minimizing the pitching moment.

NOTE: The numbers shown in the drawings indicate the inertia forces expressed in ratio to "1."



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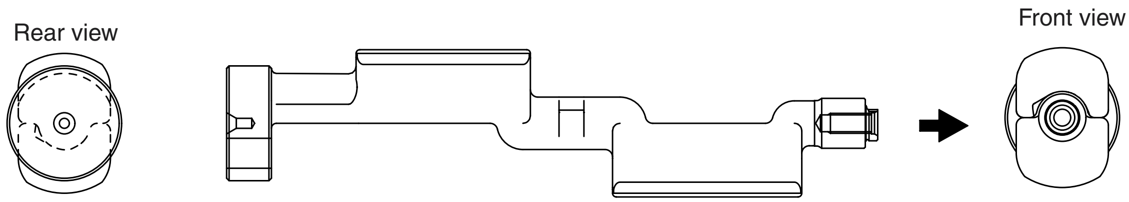
The counterbalance shaft is driven by the crankshaft via crankshaft sprocket B, the balancer chain B, the balance shaft sprocket, the balance shaft drive gear, and the balance shaft driven gear.

The balancer chain B, made up of 48 links, is an endless chain, connecting the crankshaft sprocket B with the balance shaft sprocket.

The balancer chain is provided with a mark link plate (yellow) at two locations to ensure the sprockets are timed correctly with each other.

Item	No. of teeth
Crankshaft sprocket B	22
Balance shaft sprocket	25
Balance shaft drive gear	25
Balance shaft driven gear	22

BALANCE SHAFT



The cast-iron counterbalance shaft and the integrated driven gear are driven together by the chain B.